

**Research Assessment Exercise 2020**  
**Impact Overview Statement**

**University:** | Hong Kong Baptist University |

**Unit of Assessment (UoA):** | 11 mathematics & statistics |

**Total number of eligible staff of the university in the UoA:** | 16 |

**(1) Context**

| The principal beneficiaries and audiences for the Department of Mathematics are (i) industrial sectors including social media, financial, education, commercial and software, through PhD support, collaborative research grants and consultancies; (ii) government, e.g. Hong Kong Observatory and Environmental Protection Department through similar collaborative mechanisms mentioned in (i) and (iii) schools through public engagement activity.

The principal types of impact are (i) professional services, advice, consultancies and research support; (ii) improved efficiency and efficacy of software and (iii) communication of mathematics and statistics to schools. |

**(2) Approach to impact**

| In the RAE2014, it was mentioned that Hong Kong Mathematical and Statistical communities were well equipped to enhance their role as a platform for applied and interdisciplinary research, and the Panel encouraged them to consider the opportunities offered by looking towards other areas of science, medicine, commerce and technology. The Department sees impact-led activity as a critical element of a virtuous circle, whereby mathematics and statistics are applied in novel ways and to new areas, which in turn identifies mathematical and statistical issues that inform new research.

The Department's approach to impact is the establishment of new industrial partnerships, and provision of support to enhance long-term collaboration between academic staff and end-users, and to develop novel mathematical and statistical solutions to real-life problems. The Department has a number of initiatives to bring staff and industrial partners together, providing a focal point and conduit for new external partners seeking mathematical and statistical expertise. We also support colleagues to apply for funding.

An example is the long-term partnership that has been developed with Hong Kong Observatory and Environment Protection Department of Hong Kong Government, which involve several PhD, MSc and undergraduate students. The undergraduate student (Ms. Huang Jingyan) received funding from Hong Kong X Foundation to pursue entrepreneurship and build the environment platform to serve the society. The value of these partnerships with Environment Protection Department is evidence from the 1.5M research funding projects which provided scholarships for two PhD students (Drs. Zhu Zhaochen, Yan Hanjun). Their theses are Computational Methods in Air Quality Data Assimilation and Numerical Methods for Data Assimilation in Weather Forecasting respectively. Many MSc students' dissertations were also on related topics. Through collaboration, students are trained to serve the society and we have provided scientific computing research for the Environment Protection Department for the development of an air quality data assimilation system.

The Department aims to maintain long-term collaboration with end-users, and develop novel mathematical and statistical solutions to real-life problems. The Department has provided funding to nurture and support research with direct impact. These include PhD positions, new computing facilities (multi-cores and Graphic Processing Units GPUs), funding for projects with industry, and public engagement activities (more than 200 school talks) for mathematical and statistical research. Evidence of the success of these activities is the proportion of research

funding and projects from industry arisen. During the assessment period, we have obtained two Hong Kong Government innovation and technology funding projects as project coordinators: Big Data Analytics in Online Education with Applications to Micro-Lectures and MOOCs with Origiant Technology Co., Limited, and Deep Learning-Based Trading System for Energy-Relevant Financial Products with Koi Investment Partners International Limited.

The Department recognizes the values of its staffs undertaking consultancy and providing services for outside bodies. Knowledge and research transfer and outreach activities are assessment criteria in annual review report of staff salary adjustment and promotion cases. |

**(3) Strategy and plans**

|The research strategies of the University are to produce world class research in selected research clusters (one research cluster is Data Analytics and Artificial Intelligence in Applications such as Data-journalism, Data-healthcare and Data-literature) to maximize knowledge outputs and impact, and to solve problems for and with society using close connections between HKBU researchers and external stakeholders. The University agenda provides a framework for the Department's plans as can be seen in the mentioned strategies in (2). Our aims are to increase industrial engagement in ongoing research activities, especially with PhD, MSc and Undergraduate students; provide mechanisms for maintaining and promoting new engagements in industrial contacts; and increase communication with high school students and teachers.

To build on the impact of our research, the Department plans to recruit a facilitator to increase the scale of activities so as to strengthen our connection with the industry. A possible funding can be provided by the government through the integration and collaboration of basic research and industrial application. The Department aims to increase impact through the prioritization and growth of key research areas such as data analytics in different applications, and inverse problems and imaging. The Department will make use of the new four year PhD programme to enhance our PhD training in communication, problem solving and modeling skills for industrial applications. A course focused on Industrial Mathematics and an overseas attachment programme will be offered in the PhD programme. This will enable PhD students to engage with industrial research in the world. |

**(4) Relationship to case studies**

|The Department maintains contact with alumni and advisory board members to promote impact of its research by organizing a range of activities aimed at developing new contacts with end-users. These include industrial days, where companies can present an open research problem they have to our students, and get feedback about how mathematical and statistical research could be used to tackle it. The success in developing such a culture can be seen by how individual staff are pro-active in taking advantage of opportunities which may lead to impact when they arise. For example, M. Ng provided the statistical research of quasi-Monte Carlo methods which can be applied to many areas such as the area of finance, to Koi Investment Partners International Limited via Innovation Technology Funding project (the first impact case) and used his research for the development of an adaptive learning engine in ShowMuse (the second impact case). |